## CLAIMS

**What is claimed is:**

1. A method for measuring a parameter of a target, the method comprising:

transmitting at least one signal towards a target;

receiving at least one of a return signal sent in response to a detection of the transmitted signal at the target and at least a portion of the transmitted signal back from the target;

sampling at least one portion of the received signal;

using a discrete Fourier transform to determine at least one of an amplitude of the sampled signal and a phase difference between the transmitted signal and the sampled signal; and

determining a measured parameter based on at least one of the determined amplitude of the sampled signal and the phase difference between the transmitted signal and the sampled signal.

2. The method as set forth in claim 1 wherein the discrete Fourier transform is a fast Fourier transform.

3. The method as set forth in claim 1 wherein the measured parameter is a distance to the target.

4. The method as set forth in claim 1 wherein the measured parameter is reflectivity of the target.

5. The method as set forth in claim 1 wherein the measured parameter is a velocity of the target.

6. The method as set forth in claim 1 further comprising generating a signal for the transmitting.

7. The method as set forth in claim 6 further comprising filtering the generated signal, wherein the filtering generates a sinusoidal signal for the transmitting.

8. The method as set forth in claim 6 wherein generating a signal further comprises encoding data on the signal for transmitting and wherein the determining a measured parameter further comprises decoding and outputting the encoded data from the received signal.

9. The method as set forth in claim 1 wherein the transmitted signal is a binary signal.

10. The method as set forth in claim 1 wherein the transmitted signal is electromagnetic energy.

11. The method as set forth in claim 1 wherein the transmitted signal is acoustic energy.

12. The method as set forth in claim 1 wherein the transmitted signal is a coherent burst modulation waveform.

13. The method as set forth in claim 12 wherein the coherent burst modulation waveform has an average power of less than about 5 mW.

14. The method as set forth in claim 13 wherein the coherent burst modulation waveform has an average power of less than about 1 mW.

15. The method as set forth in claim 1 wherein the transmitted signal is between about 480 nm to about 660 nm.

16. The method as set forth in claim 1 wherein the receiving further comprises focusing the portion of the transmitted signal back from the target to be received.

17. The method as set forth in claim 1 further comprising amplifying and filtering the received portion of the transmitted signal back from the target

18. The method as set forth in claim 1 wherein the sampling further comprises sampling multiple portions of the received signal and the determining further comprises determining the measured parameter based on an average of the phase differences between the transmitted signal and the sampled portions of the received signal.

19. The method as set forth in claim 18 wherein the sampled multiple portions of the received signal comprise at least twenty samples.

20. The method as set forth in claim 18 wherein the sampling multiple portions of the received signal is conducted in parallel and further comprising adjusting an amplitude of the multiple sampled portions of the received signal in parallel and converting the multiple, gain adjusted, sampled portions of the received signal to digital signals in parallel, wherein the determining a measured parameter is based on an average of the phase differences between the transmitted signal and the multiple sampled portions of the digital signals.

21. The method as set forth in claim 1 wherein the sampling comprises equivalent time sampling of the at least one portion of the received signal.

22. The method as set forth in claim 1 further comprising adjusting an amplitude of the sampled signal.

23. The method as set forth in claim 1 further comprising converting the sampled signal to a digital signal.

24. The method as set forth in claim 1 further comprising determining a phase offset from a baseline, wherein the measured parameter is based on the phase offset and the phase difference.

25. The method as set forth in claim 1 further comprising obtaining a coarse determination of the parameter, wherein the measured parameter is based on the coarse determination and the phase difference.

26. The method as set forth in claim 1 further comprising using a look-up table to correct for one or more errors in the measured parameter.

27. The method as set forth in claim 1 further comprising determining a refractive index of a medium in which the transmitted signal propagates, wherein the measured parameter is based on the refractive index of the medium and the phase difference.

28. The method as set forth in claim 27 wherein determining the refractive index further comprises obtaining a temperature reading and a pressure reading of the medium, wherein the refractive index is based on the temperature reading and the pressure reading.

29. The method as set forth in claim 1 wherein the determining a measured parameter further comprises determining a velocity of the target based on a change between at least two of the determined phase differences over time.

30. The method as set forth in claim 1 wherein the transmitting further comprises adding a code on to the transmitted signal and further comprising preventing the determining a measured parameter until the received code on the received signal substantially matches the added code.

31. The method as set forth in claim 1 wherein the measured parameter is a distance to the target, the method further comprising:

comparing the measured distance against a threshold distance; and

providing a collision alert when the comparing indicates the measured distance is less than the threshold distance.

32. The method as set forth in claim 1 wherein the transmitting further comprises starting a ramp voltage when the transmitted signal is transmitted and wherein the receiving further comprises stopping the ramp voltage when the received signal is received, the method further comprising comparing the measured amplitude against a threshold amplitude, wherein the determining further comprises determining a position of a target based on the phase difference and the ramp voltage.

33. The method as set forth in claim 1 wherein the transmitting further comprises transmitting the transmitted signal which substantially covers the target, wherein the receiving further comprises receiving portions of the transmitted signal back from different parts of the target, wherein the determining further comprises determining one or more measured parameters for each of the sample signals from the different parts of the target, the method further comprising constructing an image of the target based on the received portions of the transmitted signal from different parts of the target.

34. A system for measuring a parameter of a target, the system comprising:

a transmission system which transmits at least one signal towards a target;

a receiving system that receives at least one of a return signal sent in response to a detection of the transmitted signal at the target and at least a portion of the transmitted signal back from the target;

a sampling system that samples at least one portion of the received signal;

a parameter processing system that uses a discrete Fourier transform to determine at least one of an amplitude of the sampled signal and a

phase difference between the transmitted signal and the sampled signal and determines a measured parameter based on at least one of the determined amplitude of the sampled signal and the phase difference between the transmitted signal and the sampled signal.

35. The system as set forth in claim 34 wherein the discrete Fourier transform is a fast Fourier transform.

36. The system as set forth in claim 34 wherein the measured parameter is a distance to the target.

37. The system as set forth in claim 34 wherein the measured parameter is a velocity of the target.

38. The system as set forth in claim 34 wherein the measured parameter is reflectivity of the target.

39. The system as set forth in claim 34 further comprising a signal generator that generates a signal for the transmission system.

40. The system as set forth in claim 39 further comprising a filter that filters the generated signal and generates a sinusoidal signal for the transmission system.

41. The system as set forth in claim 39 wherein the signal generator further comprises a data encoder that encodes data on the signal for transmitting and wherein the parameter processing system further comprises a decoder that decodes and outputs the encoded data from the received signal.

42. The system as set forth in claim 34 wherein the transmission system transmits a binary signal as the transmitted signal.

43. The system as set forth in claim 34 wherein the transmission system transmits electromagnetic energy as the transmitted signal.

44. The system as set forth in claim 34 wherein the transmission system transmits acoustic energy as the transmitted signal.

45. The system as set forth in claim 34 wherein the transmission system transmits a coherent burst modulation waveform as the transmitted signal.

46. The system as set forth in claim 45 wherein the coherent burst modulation waveform has an average power of less than about 5 mW.

47. The system as set forth in claim 46 wherein the coherent burst modulation waveform has an average power of less than about 1 mW.

48. The system as set forth in claim 34 wherein the transmitted signal is between about 480 nm to about 660 nm.

49. The system as set forth in claim 34 wherein the receiving system further comprises an imaging system that focuses the portion of the transmitted signal back from the target towards the receiving system.

50. The system as set forth in claim 34 further comprising an amplifier that amplifies and filters the received portion of the transmitted signal back from the target.

51. The system as set forth in claim 34 wherein the sampling system samples multiple portions of the received signal and the parameter processing system determines the measured parameter based on an average of the phase differences between the transmitted signal and the sampled signals.

52. The system as set forth in claim 51 wherein the sampled multiple portions of the received signal comprise at least twenty samples.

53. The system as set forth in claim 51 wherein the sampling system samples the multiple portions of the received signal in parallel and further comprising a plurality of gain control systems that adjust an amplitude of each of the multiple sampled portions of the received signal in parallel and a plurality of analog-to-digital converters that convert the multiple sampled portions of the received signal to digital, wherein the parameter processing system determines the measured parameter based on an average of the phase differences between the transmitted signal and the multiple digital, gain adjusted, sampled portions of the received signal.

54. The system as set forth in claim 34 wherein the sampling system comprises an equivalent time sampling system.

55. The system as set forth in claim 34 further comprising a gain control system that adjusts an amplitude of the sampled signal.

56. The system as set forth in claim 34 further comprising converting the sampled signal to a digital signal.

57. The system as set forth in claim 34 wherein the parameter processing system determines a phase offset from a baseline, wherein the measured parameter is based on the phase offset and the phase difference.

58. The system as set forth in claim 34 wherein the parameter processing system obtains a coarse determination of the parameter, wherein the measured parameter is based on the coarse determination and the phase difference.

59. The system as set forth in claim 34 wherein the parameter processing system further comprises a stored look-up table used to correct for one or more errors in the measured parameter.

60. The system as set forth in claim 34 further comprising a sensing system used in determining a refractive index of a medium in which the transmitted signal propagates, wherein the parameter processing system determines the measured parameter based on the refractive index of the medium and the phase difference.

61. The system as set forth in claim 60 wherein sensing system comprises:

at least one temperature sensor that obtains at least one temperature reading; and

at least one pressure sensor that obtains at least one pressure reading of the medium;

wherein the parameter processing system determines the refractive index based on the temperature reading and the pressure reading.

62. The system as set forth in claim 34 wherein the parameter processing system determines a velocity of the target based on a change between at least two of the determined phase differences over time.

63. The system as set forth in claim 34 wherein the transmission system adds a code on to the transmitted signal and wherein the parameter processing system prevents the determination of the measured parameter until the received code on the received signal substantially matches the added code.

64. The system as set forth in claim 34 wherein the measured parameter is a distance to the target, the parameter processing system compares the measured distance against a threshold distance and provides a collision alert when the comparison indicates the measured distance is less than the threshold distance.

65. The system as set forth in claim 34 wherein the transmission system starts a ramp voltage when the transmitted signal is transmitted, the receiving system stops the ramp voltage when the received signal is received, and

the parameter processing system compares the measured amplitude against a threshold amplitude and determines a position of a target based on the phase difference and the ramp voltage.

66. The system as set forth in claim 1 wherein the transmission system transmits the transmitted signal which substantially covers the target, wherein the receiving system receives portions of the transmitted signal back from different parts of the target, wherein the parameter processing system determines one or more measured parameters for each of the sample signals from the different parts of the target and constructs an image of the target based on the received portions of the transmitted signal from different parts of the target.

67. A method for measuring a parameter of a target, the method comprising:

transmitting at least one signal towards a target;

receiving at least one of a return signal sent in response to a detection of the transmitted signal at the target and at least a portion of the transmitted signal back from the target;

sampling at least one portion of the received signal;

using a curve fitting algorithm to determine at least one of an amplitude of the sampled signal and a phase difference between the transmitted signal and the sampled signal; and

determining a measured parameter based at least one of the determined amplitude of the sampled signal and on the phase difference between the transmitted signal and the sampled signal.

68. The method as set forth in claim 67 wherein the curve fitting algorithm is non-linear regression.

69. The method as set forth in claim 68 wherein the non-linear regression is a Gauss-Newton formula.

70. The method as set forth in claim 67 wherein the measured parameter is a distance to the target.

71. The method as set forth in claim 67 wherein the measured parameter is a velocity of the target.

72. The method as set forth in claim 67 further comprising generating a signal for the transmitting.

73. The method as set forth in claim 72 further comprising filtering the generated signal, wherein the filtering generates a sinusoidal signal for the transmitting.

74. The method as set forth in claim 72 wherein generating a signal further comprises encoding data on the signal for transmitting and wherein the determining a measured parameter further comprises decoding and outputting the encoded data from the received signal.

75. The method as set forth in claim 67 wherein the transmitted signal is a binary signal.

76. The method as set forth in claim 67 wherein the transmitted signal is electromagnetic energy.

77. The method as set forth in claim 67 wherein the transmitted signal is acoustic energy.

78. The method as set forth in claim 67 wherein the transmitted signal is a coherent burst modulation waveform.

79. The method as set forth in claim 78 wherein the coherent burst modulation waveform has an average power of less than about 5 mW.

80. The method as set forth in claim 79 wherein the coherent burst modulation waveform has an average power of less than about 1 mW.

81. The method as set forth in claim 67 wherein the measured parameter is reflectivity of the target.

82. The method as set forth in claim 67 wherein the transmitted signal is between about 480 nm to about 660 nm.

83. The method as set forth in claim 67 wherein the receiving further comprises focusing the portion of the transmitted signal back from the target to be received.

84. The method as set forth in claim 67 further comprising amplifying and filtering the received portion of the transmitted signal back from the target

85. The method as set forth in claim 67 wherein the sampling further comprises sampling multiple portions of the received signal and the determining further comprises determining the measured parameter based on an average of the phase differences between the transmitted signal and the sampled portions of the received signal.

86. The method as set forth in claim 85 wherein the sampled multiple portions of the received signal comprise at least twenty samples.

87. The method as set forth in claim 85 wherein the sampling multiple portions of the received signal is conducted in parallel and further comprising adjusting an amplitude of the multiple sampled portions of the received signal in parallel and converting the multiple, gain adjusted, sampled portions of the received signal to digital signals in parallel, wherein the determining a measured parameter is based on an average of the phase differences

between the transmitted signal and the multiple sampled portions of the digital signals.

88. The method as set forth in claim 67 wherein the sampling comprises equivalent time sampling of the at least one portion of the received signal.

89. The method as set forth in claim 67 further comprising adjusting an amplitude of the sampled signal.

90. The method as set forth in claim 67 further comprising converting the sampled signal to a digital signal.

91. The method as set forth in claim 67 further comprising determining a phase offset from a baseline, wherein the measured parameter is based on the phase offset and the phase difference.

92. The method as set forth in claim 67 further comprising obtaining a coarse determination of the parameter, wherein the measured parameter is based on the coarse determination and the phase difference.

93. The method as set forth in claim 67 further comprising using a look-up table to correct for one or more errors in the measured parameter.

94. The method as set forth in claim 67 further comprising determining a refractive index of a medium in which the transmitted signal propagates, wherein the measured parameter is based on the refractive index of the medium and the phase difference.

95. The method as set forth in claim 94 wherein determining the refractive index further comprises obtaining a temperature reading and a pressure reading of the medium, wherein the refractive index is based on the temperature reading and the pressure reading.

96. The method as set forth in claim 67 wherein the determining a measured parameter further comprises determining a velocity of the target based on a change between at least two of the determined phase differences over time.

97. The method as set forth in claim 67 wherein the transmitting further comprises adding a code on to the transmitted signal and further comprising preventing the determining a measured parameter until the received code on the received signal substantially matches the added code.

98. The method as set forth in claim 67 wherein the measured parameter is a distance to the target, the method further comprising:

comparing the measured distance against a threshold distance; and

providing a collision alert when the comparing indicates the measured distance is less than the threshold distance.

99. The method as set forth in claim 67 wherein the transmitting further comprises starting a ramp voltage when the transmitted signal is transmitted and wherein the receiving further comprises stopping the ramp voltage when the received signal is received, the method further comprising comparing the measured amplitude against a threshold amplitude, wherein the determining further comprises determining a position of a target based on the phase difference and the ramp voltage.

100. The method as set forth in claim 67 wherein the transmitting further comprises transmitting the transmitted signal which substantially covers the target, wherein the receiving further comprises receiving portions of the transmitted signal back from different parts of the target, wherein the determining further comprises determining one or more measured parameters for each of the sample signals from the different parts of the target, the method further comprising constructing an image of the target based on the received portions of the transmitted signal from different parts of the target.

101. A system for measuring a parameter of a target, the system comprising:

a transmission system which transmits at least one signal towards a target;

a receiving system that receives at least one of a return signal sent in response to a detection of the transmitted signal at the target and at least a portion of the transmitted signal back from the target;

a sampling system that samples at least one portion of the received signal;

a parameter processing system that uses a curve fitting algorithm to determine at least one of an amplitude of the sampled signal and a phase difference between the transmitted signal and the sampled signal and determines a measured parameter based on at least one of the determined amplitude of the sampled signal and the phase difference between the transmitted signal and the sampled signal.

102. The system as set forth in claim 101 wherein the curve fitting algorithm is non-linear regression.

103. The system as set forth in claim 102 wherein the non-linear regression is a Gauss-Newton formula.

104. The system as set forth in claim 101 wherein the measured parameter is a distance to the target.

105. The system as set forth in claim 101 wherein the measured parameter is a velocity of the target.

106. The system as set forth in claim 101 wherein the measured parameter is reflectivity of the target.

107. The system as set forth in claim 101 further comprising a signal generator that generates a signal for the transmission system.

108. The system as set forth in claim 107 further comprising a filter that filters the generated signal and generates a sinusoidal signal for the transmission system.

109. The system as set forth in claim 107 wherein the signal generator further comprises a data encoder that encodes data on the signal for transmitting and wherein the parameter processing system further comprises a decoder that decodes and outputs the encoded data from the received signal.

110. The system as set forth in claim 101 wherein the transmission system transmits a binary signal as the transmitted signal.

111. The system as set forth in claim 101 wherein the transmission system transmits electromagnetic energy as the transmitted signal.

112. The system as set forth in claim 101 wherein the transmission system transmits acoustic energy as the transmitted signal.

113. The system as set forth in claim 101 wherein the transmission system transmits a coherent burst modulation waveform as the transmitted signal.

114. The system as set forth in claim 113 wherein the coherent burst modulation waveform has an average power of less than about 5 mW.

115. The method as set forth in claim 114 wherein the coherent burst modulation waveform has an average power of less than about 1 mW.

116. The system as set forth in claim 101 wherein the transmitted signal is between about 480 nm to about 660 nm.

117. The system as set forth in claim 101 wherein the receiving system further comprises an imaging system that focuses the portion of the transmitted signal back from the target towards the receiving system.

118. The system as set forth in claim 101 further comprising an amplifier that amplifies and filters the received portion of the transmitted signal back from the target.

119. The system as set forth in claim 101 wherein the sampling system samples multiple portions of the received signal and the parameter processing system determines the measured parameter based on an average of the phase differences between the transmitted signal and the sampled signals.

120. The system as set forth in claim 119 wherein the sampled multiple portions of the received signal comprise at least twenty samples.

121. The system as set forth in claim 119 wherein the sampling system samples the multiple portions of the received signal in parallel and further comprising a plurality of gain control systems that adjust an amplitude of each of the multiple sampled portions of the received signal in parallel and a plurality of analog-to-digital converters that convert the multiple sampled portions of the received signal to digital, wherein the parameter processing system determines the measured parameter based on an average of the phase differences between the transmitted signal and the multiple digital, gain adjusted, sampled portions of the received signal.

122. The system as set forth in claim 101 wherein the sampling system comprises an equivalent time sampling system.

123. The system as set forth in claim 101 further comprising a gain control system that adjusts an amplitude of the sampled signal.

124. The system as set forth in claim 101 further comprising converting the sampled signal to a digital signal.

125. The system as set forth in claim 101 further comprising a calibration system that determines a phase offset from a baseline, wherein the parameter processing system determines the measured parameter is based on the phase offset and the phase difference.

126. The system as set forth in claim 101 further comprising a coarse determination system that obtains a coarse determination of the parameter, wherein the parameter processing system determines the measured parameter based on the coarse determination and the phase difference.

127. The system as set forth in claim 101 wherein the parameter processing system further comprises a stored look-up table used to correct for one or more errors in the measured parameter.

128. The system as set forth in claim 101 further comprising a sensing system used in determining a refractive index of a medium in which the transmitted signal propagates, wherein the parameter processing system determines the measured parameter based on the refractive index of the medium and the phase difference.

129. The system as set forth in claim 128 wherein sensing system comprises:

at least one temperature sensor that obtains at least one temperature reading; and

at least one pressure sensor that obtains at least one pressure reading of the medium;

wherein the parameter processing system determines the refractive index based on the temperature reading and the pressure reading.

130. The system as set forth in claim 101 wherein the parameter processing system determines a velocity of the target based on a change between at least two of the determined phase differences over time.

131. The system as set forth in claim 101 wherein the transmission system adds a code on to the transmitted signal and wherein the parameter processing system prevents the determination of the measured parameter until the received code on the received signal substantially matches the added code.

132. The system as set forth in claim 101 wherein the measured parameter is a distance to the target, the parameter processing system compares the measured distance against a threshold distance and provides a collision alert when the comparison indicates the measured distance is less than the threshold distance.

133. The system as set forth in claim 101 wherein the transmission system starts a ramp voltage when the transmitted signal is transmitted, the receiving system stops the ramp voltage when the received signal is received, and the parameter processing system compares the measured amplitude against a threshold amplitude and determines a position of a target based on the phase difference and the ramp voltage.

134. The system as set forth in claim 101 wherein the transmission system transmits the transmitted signal which substantially covers the target, wherein the receiving system receives portions of the transmitted signal back from different parts of the target, wherein the parameter processing system determines one or more measured parameters for each of the sample signals from the different parts of the target and constructs an image of the target based on the received portions of the transmitted signal from different parts of the target.

135. A method for measuring a parameter of a target, the method comprising:

transmitting at least one signal towards a target;

receiving at least one of a return signal sent in response to a detection of the transmitted signal at the target and at least a portion of the transmitted signal back from the target;

sampling at least one portion of the received signal;

adjusting an amplitude of the sampled signal; and

determining a measured parameter based on at least one of an amplitude of the gain adjusted, sampled signal and a phase difference between the transmitted signal and the gain adjusted, sampled signal.

136. The method as set forth in claim 135 wherein the measured parameter is a distance to the target.

137. The method as set forth in claim 135 wherein the measured parameter is a velocity of the target.

138. The method as set forth in claim 135 wherein the measured parameter is reflectivity of the target.

139. The method as set forth in claim 135 further comprising generating a signal for the transmitting.

140. The method as set forth in claim 139 further comprising filtering the generated signal, wherein the filtering generates a sinusoidal signal for the transmitting.

141. The method as set forth in claim 139 wherein generating a signal further comprises encoding data on the signal for transmitting and wherein the determining a measured parameter further comprises decoding and outputting the encoded data from the received signal.

142. The method as set forth in claim 135 wherein the transmitted signal is a binary signal.

143. The method as set forth in claim 135 wherein the transmitted signal is electromagnetic energy.

144. The method as set forth in claim 135 wherein the transmitted signal is acoustic energy.

145. The method as set forth in claim 135 wherein the transmitted signal is a coherent burst modulation waveform.

146. The method as set forth in claim 145 wherein the coherent burst modulation waveform has an average power of less than about 5 mW.

147. The method as set forth in claim 146 wherein the coherent burst modulation waveform has an average power of less than about 1 mW.

148. The method as set forth in claim 135 wherein the transmitted signal is between about 480 nm to about 660 nm.

149. The method as set forth in claim 135 wherein the receiving further comprises focusing the portion of the transmitted signal back from the target to be received.

150. The method as set forth in claim 135 further comprising amplifying and filtering the received portion of the transmitted signal back from the target

151. The method as set forth in claim 135 wherein the sampling further comprises sampling multiple portions of the received signal and the determining further comprises determining the measured parameter based on an average of the phase differences between the transmitted signal and the sampled portions of the received signal.

152. The method as set forth in claim 151 wherein the sampled multiple portions of the received signal comprise at least twenty samples.

153. The method as set forth in claim 151 wherein the sampling multiple portions of the received signal is conducted in parallel and wherein the adjusting an amplitude of the sampled signal further comprises adjusting an amplitude of the multiple sampled portions of the received signal in parallel and converting the multiple, gain adjusted, sampled portions of the received signal to digital signals in parallel, wherein the determining a measured parameter is based on an average of the phase differences between the transmitted signal and the multiple sampled portions of the digital signals.

154. The method as set forth in claim 135 wherein the sampling comprises equivalent time sampling of the at least one portion of the received signal.

155. The method as set forth in claim 135 further comprising converting the sampled signal to a digital signal.

156. The method as set forth in claim 135 further comprising determining a phase offset from a baseline, wherein the measured parameter is based on the phase offset and the phase difference.

157. The method as set forth in claim 135 further comprising obtaining a coarse determination of the parameter, wherein the measured parameter is based on the coarse determination and the phase difference.

158. The method as set forth in claim 135 further comprising using a look-up table to correct for one or more errors in the measured parameter.

159. The method as set forth in claim 135 further comprising determining a refractive index of a medium in which the transmitted signal

propagates, wherein the measured parameter is based on the refractive index of the medium and the phase difference.

160. The method as set forth in claim 159 wherein determining the refractive index further comprises obtaining a temperature reading and a pressure reading of the medium, wherein the refractive index is based on the temperature reading and the pressure reading.

161. The method as set forth in claim 135 wherein the determining a measured parameter further comprises determining a velocity of the target based on a change between at least two of the determined phase differences over time.

162. The method as set forth in claim 135 wherein the transmitting further comprises adding a code on to the transmitted signal and further comprising preventing the determining a measured parameter until the received code on the received signal substantially matches the added code.

163. The method as set forth in claim 135 wherein the measured parameter is a distance to the target, the method further comprising:

comparing the measured distance against a threshold distance; and

providing a collision alert when the comparing indicates the measured distance is less than the threshold distance.

164. The method as set forth in claim 135 wherein the transmitting further comprises starting a ramp voltage when the transmitted signal is transmitted and wherein the receiving further comprises stopping the ramp voltage when the received signal is received, the method further comprising comparing the measured amplitude against a threshold amplitude, wherein the determining further comprises determining a position of a target based on the phase difference and the ramp voltage.

165. The method as set forth in claim 135 wherein the transmitting further comprises transmitting the transmitted signal which substantially covers the target, wherein the receiving further comprises receiving portions of the transmitted signal back from different parts of the target, wherein the determining further comprises determining one or more measured parameters for each of the sample signals from the different parts of the target, the method further comprising constructing an image of the target based on the received portions of the transmitted signal from different parts of the target.

166. A system for measuring a parameter of a target, the system comprising:

a transmission system which transmits at least one signal towards a target;

a receiving system that receives at least one of a return signal sent in response to a detection of the transmitted signal at the target and at least a portion of the transmitted signal back from the target;

a sampling system that samples at least one portion of the received signal;

a gain control system that adjusts an amplitude of the sampled signal; and

a parameter processing system that determines a measured parameter based on at least one of an amplitude of the gain adjusted, sampled signal and a phase difference between the transmitted signal and the sampled signal.

167. The system as set forth in claim 166 wherein the measured parameter is a distance to the target.

168. The system as set forth in claim 166 wherein the measured parameter is a velocity of the target.

169. The system as set forth in claim 166 wherein the measured parameter is reflectivity of the target.

170. The system as set forth in claim 166 further comprising a signal generator that generates a signal for the transmission system.

171. The system as set forth in claim 169 further comprising a filter that filters the generated signal and generates a sinusoidal signal for the transmission system.

172. The system as set forth in claim 169 wherein the signal generator further comprises a data encoder that encodes data on the signal for transmitting and wherein the parameter processing system further comprises a decoder that decodes and outputs the encoded data from the received signal.

173. The system as set forth in claim 166 wherein the transmission system transmits a binary signal as the transmitted signal.

174. The system as set forth in claim 166 wherein the transmission system transmits electromagnetic energy as the transmitted signal.

175. The system as set forth in claim 166 wherein the transmission system transmits acoustic energy as the transmitted signal.

176. The system as set forth in claim 166 wherein the transmission system transmits a coherent burst modulation waveform as the transmitted signal.

177. The system as set forth in claim 176 wherein the coherent burst modulation waveform has an average power of less than about 5 mW.

178. The system as set forth in claim 177 wherein the coherent burst modulation waveform has an average power of less than about 1 mW.

179. The system as set forth in claim 174 wherein the transmitted signal is between about 480 nm to about 660 nm.

180. The system as set forth in claim 166 wherein the receiving system further comprises an imaging system that focuses the portion of the transmitted signal back from the target towards the receiving system.

181. The system as set forth in claim 166 further comprising an amplifier that amplifies and filters the received portion of the transmitted signal back from the target.

182. The system as set forth in claim 166 wherein the sampling system samples multiple portions of the received signal and the parameter processing system determines the measured parameter based on an average of the phase differences between the transmitted signal and the sampled signals.

183. The system as set forth in claim 182 wherein the sampled multiple portions of the received signal comprise at least twenty samples.

184. The system as set forth in claim 161 wherein the sampling system samples the multiple portions of the received signal in parallel and further comprising a plurality of the gain control system wherein each of the plurality of gain control systems adjusts an amplitude of one of the multiple sampled portions of the received signal in parallel and a plurality of analog-to-digital converters that convert the multiple, gain adjusted, sampled portions of the received signal to digital, wherein the parameter processing system determines the measured parameter based on an average of the phase differences between the transmitted signal and the multiple digital, gain adjusted, sampled portions of the received signal.

185. The system as set forth in claim 166 wherein the sampling system comprises an equivalent time sampling system.

186. The system as set forth in claim 166 further comprising converting the sampled signal to a digital signal.

187. The system as set forth in claim 166 further comprising a calibration system that determines a phase offset from a baseline, wherein the parameter processing system determines the measured parameter is based on the phase offset and the phase difference.

188. The system as set forth in claim 166 further comprising a coarse determination system that obtains a coarse determination of the parameter, wherein the parameter processing system determines the measured parameter based on the coarse determination and the phase difference.

189. The system as set forth in claim 166 wherein the parameter processing system further comprises a stored look-up table used to correct for one or more errors in the measured parameter.

190. The system as set forth in claim 166 further comprising a sensing system used in determining a refractive index of a medium in which the transmitted signal propagates, wherein the parameter processing system determines the measured parameter based on the refractive index of the medium and the phase difference.

191. The system as set forth in claim 190 wherein sensing system comprises:

at least one temperature sensor that obtains at least one temperature reading; and

at least one pressure sensor that obtains at least one pressure reading of the medium;

wherein the parameter processing system determines the refractive index based on the temperature reading and the pressure reading.

192. The system as set forth in claim 166 wherein the parameter processing system determines a velocity of the target based on a change between at least two of the determined phase differences over time.

193. The system as set forth in claim 166 wherein the transmission system adds a code on to the transmitted signal and wherein the parameter processing system prevents the determination of the measured parameter until the received code on the received signal substantially matches the added code.

194. The system as set forth in claim 166 wherein the measured parameter is a distance to the target, the parameter processing system compares the measured distance against a threshold distance and provides a collision alert when the comparison indicates the measured distance is less than the threshold distance.

195. The system as set forth in claim 166 wherein the transmission system starts a ramp voltage when the transmitted signal is transmitted, the receiving system stops the ramp voltage when the received signal is received, and the parameter processing system compares the measured amplitude against a threshold amplitude and determines a position of a target based on the phase difference and the ramp voltage.

196. The system as set forth in claim 166 wherein the transmission system transmits the transmitted signal which substantially covers the target, wherein the receiving system receives portions of the transmitted signal back from different parts of the target, wherein the parameter processing system determines one or more measured parameters for each of the sample signals from the different parts of the target and constructs an image of the target based on the received portions of the transmitted signal from different parts of the target.

197. A method for measuring a parameter of a target, the method comprising:

transmitting at least one signal towards a target;

receiving at least one of a return signal sent in response to a detection of the transmitted signal at the target and at least a portion of the transmitted signal back from the target;

equivalent time sampling of at least one portion of the received signal;

determining a measured parameter based on at least one of an amplitude of the sampled signal a phase difference between the transmitted signal and the sampled signal.

198. The method as set forth in claim 197 wherein the measured parameter is a distance to the target.

199. The method as set forth in claim 197 wherein the measured parameter is a velocity of the target.

200. The method as set forth in claim 197 wherein the measured parameter is reflectivity of the target.

201. The method as set forth in claim 197 further comprising generating a signal for the transmitting.

202. The method as set forth in claim 201 further comprising filtering the generated signal, wherein the filtering generates a sinusoidal signal for the transmitting.

203. The method as set forth in claim 201 wherein generating a signal further comprises encoding data on the signal for transmitting and wherein the determining a measured parameter further comprises decoding and outputting the encoded data from the received signal.

204. The method as set forth in claim 197 wherein the transmitted signal is a binary signal.

205. The method as set forth in claim 197 wherein the transmitted signal is electromagnetic energy.

206. The method as set forth in claim 197 wherein the transmitted signal is acoustic energy.

207. The method as set forth in claim 197 wherein the transmitted signal is a coherent burst modulation waveform.

208. The method as set forth in claim 207 wherein the coherent burst modulation waveform has a power of less than about 5 mW.

209. The method as set forth in claim 208 wherein the coherent burst modulation waveform has an average power of less than about 1 mW.

210. The method as set forth in claim 197 wherein the transmitted signal is between about 480 nm to about 660 nm.

211. The method as set forth in claim 197 wherein the receiving further comprises focusing the portion of the transmitted signal back from the target to be received.

212. The method as set forth in claim 197 further comprising amplifying and filtering the received portion of the transmitted signal back from the target

213. The method as set forth in claim 197 wherein the sampling further comprises sampling multiple portions of the received signal and the determining further comprises determining the measured parameter based on an average of the phase differences between the transmitted signal and the sampled portions of the received signal.

214. The method as set forth in claim 213 wherein the sampled multiple portions of the received signal comprise at least twenty samples.

215. The method as set forth in claim 213 wherein the sampling multiple portions of the received signal is conducted in parallel and further comprising adjusting an amplitude of the multiple sampled portions of the received signal in parallel and converting the multiple, gain adjusted, sampled portions of the received signal to digital signals in parallel, wherein the determining a measured parameter is based on an average of the phase differences between the transmitted signal and the multiple sampled portions of the digital signals.

216. The method as set forth in claim 197 further comprising converting the sampled signal to a digital signal.

217. The method as set forth in claim 197 further comprising determining a phase offset from a baseline, wherein the measured parameter is based on the phase offset and the phase difference.

218. The method as set forth in claim 197 further comprising obtaining a coarse determination of the parameter, wherein the measured parameter is based on the coarse determination and the phase difference.

219. The method as set forth in claim 197 further comprising using a look-up table to correct for one or more errors in the measured parameter.

220. The method as set forth in claim 197 further comprising determining a refractive index of a medium in which the transmitted signal propagates, wherein the measured parameter is based on the refractive index of the medium and the phase difference.

221. The method as set forth in claim 220 wherein determining the refractive index further comprises obtaining a temperature reading and a

pressure reading of the medium, wherein the refractive index is based on the temperature reading and the pressure reading.

222. The method as set forth in claim 197 wherein the determining a measured parameter further comprises determining a velocity of the target based on a change between at least two of the determined phase differences over time.

223. The method as set forth in claim 197 wherein the transmitting further comprises adding a code on to the transmitted signal and further comprising preventing the determining a measured parameter until the received code on the received signal substantially matches the added code.

224. The method as set forth in claim 197 wherein the measured parameter is a distance to the target, the method further comprising:

comparing the measured distance against a threshold distance; and

providing a collision alert when the comparing indicates the measured distance is less than the threshold distance.

225. The method as set forth in claim 197 wherein the transmitting further comprises starting a ramp voltage when the transmitted signal is transmitted and wherein the receiving further comprises stopping the ramp voltage when the received signal is received, the method further comprising comparing the measured amplitude against a threshold amplitude, wherein the determining further comprises determining a position of a target based on the phase difference and the ramp voltage.

226. The method as set forth in claim 197 wherein the transmitting further comprises transmitting the transmitted signal which substantially covers the target, wherein the receiving further comprises receiving portions of the transmitted signal back from different parts of the target, wherein the determining further comprises determining one or more measured parameters

for each of the sample signals from the different parts of the target, the method further comprising constructing an image of the target based on the received portions of the transmitted signal from different parts of the target.

227. A system for measuring a parameter of a target, the system comprising:

a transmission system which transmits at least one signal towards a target;

a receiving system that receives at least one of a return signal sent in response to a detection of the transmitted signal at the target and at least a portion of the transmitted signal back from the target;

an equivalent time sampling system that samples at least one portion of the received signal; and

a parameter processing system that determines a measured parameter based on at least one of an amplitude of the sampled signal a phase difference between the transmitted signal and the sampled signal.

228. The system as set forth in claim 227 wherein the measured parameter is a distance to the target.

229. The system as set forth in claim 227 wherein the measured parameter is a velocity of the target.

230. The method as set forth in claim 227 wherein the measured parameter is reflectivity of the target.

231. The system as set forth in claim 227 further comprising a signal generator that generates a signal for the transmission system.

232. The system as set forth in claim 231 further comprising a filter that filters the generated signal and generates a sinusoidal signal for the transmission system.

233. The system as set forth in claim 231 wherein the signal generator further comprises a data encoder that encodes data on the signal for transmitting and wherein the parameter processing system further comprises a decoder that decodes and outputs the encoded data from the received signal.

234. The system as set forth in claim 227 wherein the transmission system transmits a binary signal as the transmitted signal.

235. The system as set forth in claim 227 wherein the transmission system transmits electromagnetic energy as the transmitted signal.

236. The system as set forth in claim 227 wherein the transmission system transmits acoustic energy as the transmitted signal.

237. The system as set forth in claim 227 wherein the transmission system transmits a coherent burst modulation waveform as the transmitted signal.

238. The system as set forth in claim 207 wherein the coherent burst modulation waveform has a power of less than about 5 mW.

239. The system as set forth in claim 238 wherein the coherent burst modulation waveform has an average power of less than about 1 mW.

240. The system as set forth in claim 227 wherein the transmitted signal is between about 480 nm to about 660 nm.

241. The system as set forth in claim 227 wherein the receiving system further comprises an imaging system that focuses the portion of the transmitted signal back from the target towards the receiving system.

242. The system as set forth in claim 227 further comprising an amplifier that amplifies and filters the received portion of the transmitted signal back from the target.

243. The system as set forth in claim 227 wherein the sampling system samples multiple portions of the received signal and the parameter processing system determines the measured parameter based on an average of the phase differences between the transmitted signal and the sampled signals.

244. The system as set forth in claim 243 wherein the sampled multiple portions of the received signal comprise at least twenty samples.

245. The system as set forth in claim 243 wherein the sampling system samples the multiple portions of the received signal in parallel and further comprising a plurality of gain control systems that adjust an amplitude of each of the multiple sampled portions of the received signal in parallel and a plurality of analog-to-digital converters that convert the multiple sampled portions of the received signal to digital, wherein the parameter processing system determines the measured parameter based on an average of the phase differences between the transmitted signal and the multiple digital, gain adjusted, sampled portions of the received signal.

246. The system as set forth in claim 227 further comprising converting the sampled signal to a digital signal.

247. The system as set forth in claim 227 further comprising a calibration system that determines a phase offset from a baseline, wherein the parameter processing system determines the measured parameter is based on the phase offset and the phase difference.

248. The system as set forth in claim 227 further comprising a coarse determination system that obtains a coarse determination of the parameter,

wherein the parameter processing system determines the measured parameter based on the coarse determination and the phase difference.

249. The system as set forth in claim 227 wherein the parameter processing system further comprises a stored look-up table used to correct for one or more errors in the measured parameter.

250. The system as set forth in claim 227 further comprising a sensing system used in determining a refractive index of a medium in which the transmitted signal propagates, wherein the parameter processing system determines the measured parameter based on the refractive index of the medium and the phase difference.

251. The system as set forth in claim 250 wherein sensing system comprises:

at least one temperature sensor that obtains at least one temperature reading; and

at least one pressure sensor that obtains at least one pressure reading of the medium;

wherein the parameter processing system determines the refractive index based on the temperature reading and the pressure reading.

252. The system as set forth in claim 227 wherein the parameter processing system determines a velocity of the target based on a change between at least two of the determined phase differences over time.

253. The system as set forth in claim 227 wherein the transmission system adds a code on to the transmitted signal and wherein the parameter processing system prevents the determination of the measured parameter until the received code on the received signal substantially matches the added code.

254. The system as set forth in claim 227 wherein the measured parameter is a distance to the target, the parameter processing system compares the measured distance against a threshold distance and provides a collision alert when the comparison indicates the measured distance is less than the threshold distance.

255. The system as set forth in claim 227 wherein the transmission system starts a ramp voltage when the transmitted signal is transmitted, the receiving system stops the ramp voltage when the received signal is received, and the parameter processing system compares the measured amplitude against a threshold amplitude and determines a position of a target based on the phase difference and the ramp voltage.

256. The system as set forth in claim 227 wherein the transmission system transmits the transmitted signal which substantially covers the target, wherein the receiving system receives portions of the transmitted signal back from different parts of the target, wherein the parameter processing system determines one or more measured parameters for each of the sample signals from the different parts of the target and constructs an image of the target based on the received portions of the transmitted signal from different parts of the target.